WEST Search History

DATE: Monday, October 20, 2003

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT; PLUR=YES; OP=ADJ			
L18	L17 and (knowledge)	2	L18
L17	L16 or l15 or l14 or l11 or l10 or l9 or l8 or l7 or l6 or l5 or l4 or l3 or l1	7	L17
L16	6266774.pn.	1	L16
L15	6266810.pn.	1	L15
L14	6327617.pn.	1	L14
L13	6266810.pn.L12	0	L13
L12	6327617.pn.L11	0	L12
L11	6353926.pn.	1	L11
L10	6240550.pn.	1	L10
L9	6353926.pn.	1	L9
L8	6327617.pn.	1	L8
L7	6266810.pn.	1	L7
L6	6266774.pn.	1	L6
L5	6240550.pn.	1	L5
L4	6151643.pn.	1	L4
L3	5809282.pn.	1	L3
L2	L1 and (knowledge)	0	L2
L1	6151643.pn.	1	L1

END OF SEARCH HISTORY

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L18: Entry 2 of 2 File: USPT Sep 15, 1998

DOCUMENT-IDENTIFIER: US 5809282 A
TITLE: Automated network simulation and optimization system

Abstract Text (1):
A system for selecting options for modifying a network architecture in accordance with user preferences using a knowledge base and a database. The knowledge base includes rules to select modification categories and the database includes information on a plurality of equipment and a plurality of tariffs. To select the options, the system generates a base-line simulation from the network architecture, which base-line simulation includes performance data on the network architecture under a predetermined scenario. Modification categories based on the user preferences are selected using rules in the knowledge base, and equipment information and tariff information corresponding to the network modification categories are selected from the database to create modification options for the network modification categories. The modification options are evaluated using rules in the knowledge base. The system then generates a plurality of new simulations of the network architecture as modified by the modification options, and compares the performance data of the base-line simulation with performance data of the new simulations to specify differences in performance data between the base-line simulation and each new simulation. Finally, the modification options (each corresponding to one of the new simulations) are ranked using the specified differences in performance data between the base-line simulation and each new simulation, user preferences, and rules of the knowledge base.

US Patent No. (1):
5809282

Brief Summary Text (15):
To achieve the objects of this invention and attain its advantages, broadly speaking, this invention selects options for modifying a network architecture in accordance with user preferences. The selection process is performed in a data processing system including a knowledge base of rules used to select modification options. In the broadest sense, the selection process includes four steps: (1) generating a base-line simulation from a network architecture, with the base-line simulation including performance data on the network architecture under a predetermined scenario; (2) generating, using at least one rule in the knowledge base, modification options based on the user preferences; (3) generating a plurality of new simulations of the network architecture as modified based on the modification options; and (4) ranking the modification options, each corresponding to one of the new simulations, according to differences in performance data between the base-line simulation and each new simulation and according to the user preferences.

Detailed Description Text (43):
Expert system 735 includes a knowledge base 750 and an inference engine 740. Knowledge base 750 includes knowledge of experts in networking in the form of a rule-base consisting of a plurality of IF-THEN rules. These rules represent conditions (in the IF part of a rule) that experts consider in making determinations about modifying network architectures analyzing both performance issues (raised by the scenario assessment, architecture assessment, and cost assessment) and user preference data. Inference engine 740 generally applies performance data from a simulation and user preference data to sets of rules in knowledge base 750 to provide optimizer 220a responses to queries (1) and (2).

Detailed Description Text (44):
Selected network modification options, for example, the ten best options, are then

provided to network simulator 210, which generates simulations for each network modification option (based on the base-line simulation for the original network architecture). The simulation for each network modification option is then provided to combinatorial optimizer 220b, which generates combinations of network modification options for modifying the network architecture according to user preference data and performance data, i.e., scenario assessment data, architecture assessment data, and cost assessment data, for simulations for each network modification option. In generating the combinations of network modification options, combinatorial optimizer 220b also queries expert system 735 for a determination on whether specific combinations of modification options meet conditions of the user preference data. To make this determination, inference engine 740 selects an appropriate set of rules from knowledge base 750 corresponding to the combination of modification options to be considered, and applies the selected set of rules using the user preference data. Inference engine 740 then provides combinatorial optimizer 220b a responsive decision on whether a combination of modification options meets requirements of the user preference data.

Detailed Description Text (47):
In ranking the modification options and combinations of modification options, effectiveness analyzer 230 also queries expert system 735 for a ranking (e.g., very high, high, moderate, low, very low) for each modification option and combination of modification options. To make this ranking, inference engine 740 selects an appropriate set of rules from knowledge base 750 (combinatorial rule set) and applies that set of rules to the simulation for each modification option in a combination considering user preference data as well. Application of the rule set provides a ranking for the option or combination, which ranking the inference engine 740 provides in the form of a decision on each option or combination to effectiveness analyzer 230.

Detailed Description Text (94):
To determine whether consideration of options corresponding to an option category is warranted, inference engine 740 follows the inference engine procedure 1200 shown in FIG. 12. First, inference engine 740 receives the inquiry for a determination from the optimizer 220a (step 1210). Inference engine 740 then selects from knowledge base 750 a rule set for the inquiry (e.g., rules for determining whether consideration of an option category is warranted) (step 1220). The selected rule set is then applied to the inquiry (step 1230) so inference engine 740 can generate a decision (i.e., warranted or not warranted) responsive to the inquiry (step 1240).

Detailed Description Text (99):
After the network modification options are generated (step 915), optimizer 220a selects one of the network modification options (step 920) for evaluation (step 925). Step 925 also uses the inference engine procedure 1200 described above with reference to FIG. 12. As applied to step 925, the inference engine 740 selects a rule set from knowledge base 750 corresponding to a modification option being evaluated (step 1220); applies the selected rule set to (1) the scenario assessment data, architecture assessment data, and cost assessment data of the base-line simulation, and (2) user preference data (step 1230); and generates the expert decision on the value of the modification option (e.g., very high, high, moderate, low, very low) (step 1240).

Detailed Description Text (113):
Combinatorial optimizer 220b uses inference engine 740 to determine whether a combination of options meet user preference data. In a manner similar to that described above with respect to step 925 of optimizing procedure 900, inference engine 740 receives an inquiry, i.e., a combination option, from combinatorial optimizer 220b (step 1210 of FIG. 12). The inference engine 740 selects from the knowledge base 750 a rule set for the combination option from combinatorial optimizer 220b (step 1220) and applies the rule set to the combination option (step 1230). Inference engine 740 then generates an expert decision as to whether the combination option satisfies the user preference data (step 1240) and provides that decision to combinatorial optimizer 220b.

Detailed Description Text (123):
FIG. 11 is a flow chart of the effectiveness analyzing procedure 1100 performed by effectiveness analyzer 230 to rank simulations corresponding to the network modification options selected by optimizer 220a and combinations of network modification options selected by combinatorial optimizer 220b. First, effectiveness analyzer 230 uses the inference engine 740 to evaluate statistics such as scenario assessment data, architecture assessment data, and cost assessment data of the base-line simulation for the original network architecture with the same statistics of

simulations for the network modification options and combinations of network modification options (step 1110). This comparison provides a delta (or difference) for each value of the scenario assessment data, architecture assessment data, and cost assessment data. These deltas are then applied to rules in knowledge base 750 by inference engine 740.

Detailed Description Text (124):
In this case, inference engine 740 applies the deltas from the comparison of the base-line simulation with the simulation for each modification option and combination to a rule set, which is selected from knowledge base 750 based on which of the deltas is being examined. Inference engine 740 then generates a value (very high, high, moderate, low, very low) for the option or combination based on the deltas and the user preference data.

Detailed Description Text (125):
An example of a rule in knowledge base 750 used for this purpose is:

CLAIMS:

1. A method of selecting options for modifying a network architecture performed in a data processing system including a knowledge base of rules used to select modification categories and a database including information on a plurality of equipment and a plurality of tariffs, the method comprising the steps of:

receiving a user preference specifying a qualitative factor for optimizing the network architecture;

generating a base-line simulation from the network architecture, the base-line simulation including performance data on the network architecture under a predetermined scenario;

selecting, using at least one rule in the knowledge base, modification categories based on the user preference;

selecting from the database at least one of equipment and tariff information corresponding to at least one of the network modification categories to create modification options for the one of the network modification categories;

generating a plurality of new simulations of the network architecture modified in accordance with the modification options;

comparing the performance data of the base-line simulation with performance data of the new simulations to specify differences in performance data between the base-line simulation and each new simulation;

ordering the modification options, each corresponding to one of the new simulations, using the specified differences in performance data between the base-line simulation and each new simulation, the user preference, and at least one rule of the knowledge base;

generating combinations of the modification options;

eliminating, using at least one rule in the knowledge base, ones of the combinations of modification options based on the user preference;

generating a plurality of new combination simulations of the network architecture as modified by the combinations of modification options;

comparing the performance data of the base-line simulation with performance data of the new combination simulations to specify differences in performance data between the base-line simulation and each new combination simulation; and

ordering the modification options, each corresponding to one of the new combination simulations, using the specified differences in performance data between the base-line simulation and each new combination simulation, user preference, and at least one rule of the knowledge base.

2. The method of claim 1 further comprising the step of:

generating a report specifying the ordered modification options and listing for each modification option of the rule from the knowledge base used to order the option.

5. A method of selecting options for modifying a network architecture performed in a data processing system including a knowledge base of rules used to select modification options, the method comprising the steps of:

receiving a user preference specifying a qualitative factor optimizing the network architecture;

generating a base-line simulation from the network architecture, the base-line simulation including performance data on the network architecture under a predetermined scenario;

generating, using at least one rule in the knowledge base, modification options based on the user preference;

generating a plurality of new simulations of the network architecture as modified based on the modification options;

ranking the modification options, each corresponding to one of the new simulations, according to differences in performance data between the base-line simulation and each new simulation and according to the user preference;

generating combinations of the modification options;

eliminating, using at least one rule in the knowledge base, ones of the combinations of modification options based on the user preference;

generating a plurality of new combination simulations of the network architecture as modified by the combinations of modification options; and

ranking the modification options, each corresponding to one of the new combination simulations, according to differences in performance data between the base-line simulation and each new combination simulation and according to the user preference.

10. A system for selecting options for modifying a network architecture using a knowledge base of rules for selecting modification categories and a database including information on a plurality of equipment and a plurality of tariffs, the system comprising:

means for receiving a user preference specifying a qualitative factor for optimizing the network architecture;

means for generating a base-line simulation from the network architecture, the base-line simulation including performance data on the network architecture under a predetermined scenario;

means for selecting, using at least one rule in the knowledge base, modification categories based on the user preference;

means for selecting from the database at least one of equipment and tariff information corresponding to at least one of the network modification categories to create modification options for the one of the network modification categories;

means for generating a plurality of new simulations of the network architecture as modified by the modification options;

means for comparing the performance data of the base-line simulation with performance data of the new simulations to specify differences in performance data between the base-line simulation and each new simulation;

means for ranking the modification options, each corresponding to one of the new simulations, using the specified differences in performance data between the base-line simulation and each new simulation, user preference, and at least one rule of the knowledge base;

means for generating combinations of the modification options;

means for eliminating, using at least one rule in the knowledge base, ones of the combinations of modification options based on the user preference;

means for generating a plurality of new combination simulations of the network architecture as modified by the combinations of modification options;

means for comparing the performance data of the base-line simulation with performance data of the new combination simulations to specify differences in performance data between the base-line simulation and each new combination simulation; and

means for ranking the modification options, each corresponding to one of the new combination simulations, using the specified differences in performance data between the base-line simulation and each new combination simulation, user preference, and at least one rule of the knowledge base.

11. A system for selecting options for modifying a network architecture using a knowledge base of rules used to select modification options, the system comprising:

means for receiving a user preference specifying a qualitative factor for optimizing the network architecture;

means for generating a base-line simulation from the network architecture, the base-line simulation including performance data on the network architecture under a predetermined scenario;

means for generating, using at least one rule in the knowledge base, modification options based on the user preference;

means for generating a plurality of new simulations of the network architecture as modified based on the modification options; and

means for ranking the modification options, each corresponding to one of the new simulations, according to differences in performance data between the base-line simulation and each new simulation and according to the user preference;

means for generating combinations of the modification options;

means for eliminating, using at least one rule in the knowledge base, ones of the combinations of modification options based on the user preference;

means for generating a plurality of new combination simulations of the network architecture as modified by the combinations of modification options; and

means for ranking the modification options, each corresponding to one of the new combination simulations, according to differences in performance data between the base-line simulation and each new combination simulation and according to the user preference.